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PRELIMINARY STUDY ON PESTICIDE CONTAMINATION IN ALBANIAN AGRICULTURAL SOILS: CHALLENGES, RISK, AND SUSTAINABLE MANAGEMENT STRATEGIES

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Abstract

Pesticides are widely used in modern agriculture to safeguard crops against pests, weeds, and diseases. Their extensive and often indiscriminate application has raised serious environmental concerns in Albania. Agricultural soils act as reservoirs for pesticide residues, which pose risks of leaching into groundwater, contaminating water sources, and entering the food chain, potentially endangering human health. This study examines the presence of pesticide residues in agricultural soils from various regions in Albania, providing insights into contamination levels and associated environmental risks.

A systematic soil sampling procedure was conducted on farms dedicated to vegetable cultivation. Following extraction and cleanup using the multiresidue QuEChERS method, samples were analyzed according to European Normative EN 15662. High-sensitivity techniques, including gas and liquid chromatography coupled with triple quadrupole mass spectrometry detection (Agilent 7000D GC-MS/MS, Agilent 6460 LC-MS/MS), were employed for quantification. The pesticide classes examined in this study included organochlorines, organophosphates, and carbamates.

Variability found in pesticide concentrations across different agricultural areas reflects differences in pesticide application practices among farms. The assessment includes contamination thresholds, bioaccumulation in crops, and the impact on soil microorganisms.

The study emphasizes the importance of stricter regulatory enforcement to ensure compliance with pesticide usage guidelines and residue limits. Additionally, educating farmers on sustainable pest management, integrated pest control, and the safe handling and disposal of pesticides is essential for reducing environmental and health risks.

Key words: *Pesticide residues, Agricultural soil, Albania, Sustainable pest management.*